International Standard

ISO 17956

Rolling bearings — Method for calculating the effective static safety factor for universally loaded rolling bearings

Roulements — Méthode de calcul du facteur de sécurité statique efficace pour les roulements chargés universellement

First edition
2025-01

Reference number
ISO 17956:2025(en)

© ISO 2025



COPYRIGHT PROTECTED DOCUMENT

© ISO 2025

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols **2**
5 Calculation of the effective static safety factor **2**
5.1 General 2
5.2 Effective static safety factor for ball bearings 3
5.3 Effective static safety factor for roller bearings 4
5.4 Guideline values of the effective static safety factor 4
Annex A (informative) **Further information** **5**
Bibliography **10**

© ISO 2025 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 8, *Load ratings and life.*

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2025 – All rights reserved

Introduction

ISO 76 specifies a simplified method for the calculation of static safety factor of rolling bearings. However, this method cannot account for actual operating conditions like tilt, misalignment, moment load or for operating clearance.

The calculation method specified in this document is based on the detailed analysis of bearing internal load distribution, as described in ISO 16281[1]. It uses maximum ball or lamina loads for the calculation of the effective static safety factor, thus following the general principle of ISO 76. The calculation method yields no satisfactory results for rolling bearings subjected to considerable truncation of the area of contact between the rolling elements and the raceway.

The primary purpose of this document is to provide a unified and manufacturer-independent advanced calculation method that allows for the consideration of actual operating conditions, thus enabling the end user to compare different bearing solutions on the same calculation basis. It is also intended to serve as a manufacturer-independent neutral basis for certification purposes, for example, as required per IEC 61400-4[2] for bearings in wind turbine gearboxes.

It is not intended to supersede other advanced bearing analysis methods that are currently used in the design process as the primary tool for bearing design and selection.

The static load rating according to ISO 76 was originally based on a permanent plastic deformation under static load, i.e. a constant load on a non-rotating bearing. However, it is common practice in rolling bearing design and analysis to calculate the static safety factor also for rotating load cases. Therefore, it is recommended to calculate the effective static safety factor for the load situation where the maximum contact load occurs, independent of rotating or non-rotating condition.

© ISO 2025 – All rights reserved

Rolling bearings — Method for calculating the effective static safety factor for universally loaded rolling bearings

1 Scope

This document specifies the calculation of the effective static safety factor under consideration of tilt or misalignment, operating clearance of the bearing, and internal load distribution on rolling elements. The calculation method provided in this document covers influencing parameters in addition to those described in ISO 76.

The directions and limitations given in ISO 76 and ISO 20056-2 apply to this document. The calculation method pertains to the static safety factor of the bearings. Other mechanisms of failure, like false brinelling, fatigue life, wear or microspalling (gray-staining), lie outside the scope of this document.

This document applies to single and multi-row radial and thrust ball and roller bearings, subjected to radial and axial load and with radial clearance and tilt taken into account. References to methods for the analysis of the internal load distribution under general load are given.

The analysis of effective static safety factor for multi-row bearings or bearings of a more complex geometry can be derived from the formulae given in this document. For these bearings, the load distribution for each individual row is considered.

The calculation of effective static safety factor is also applicable to hybrid bearings, using the static load ratings according to ISO 20056-2.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 76:2006, *Rolling bearings — Static load ratings*

ISO 5593, *Rolling bearings — Vocabulary*

ISO 15241, *Rolling bearings — Symbols for physical quantities*

ISO 20056-2:2017, *Rolling bearings — Load ratings for hybrid bearings with rolling elements made of ceramic — Part 2: Static load ratings*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 76, ISO 5593, ISO 20056-2, and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

© ISO 2025 – All rights reserved